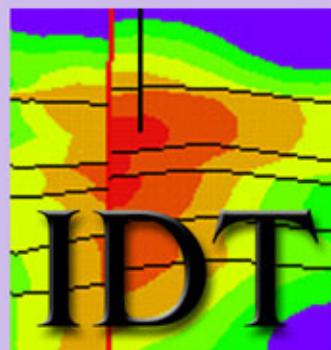
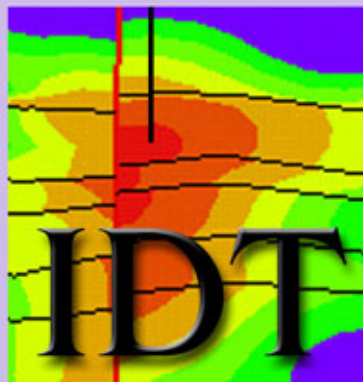


**Significant Risk Reduction
in the Exploration
for Anomally Pressured
Gas Assets in
Rocky Mountain Laramide Basins**



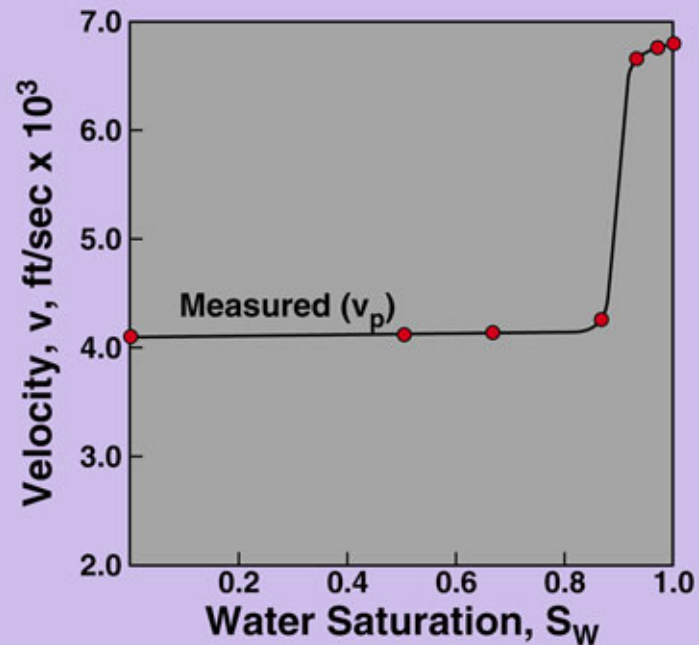
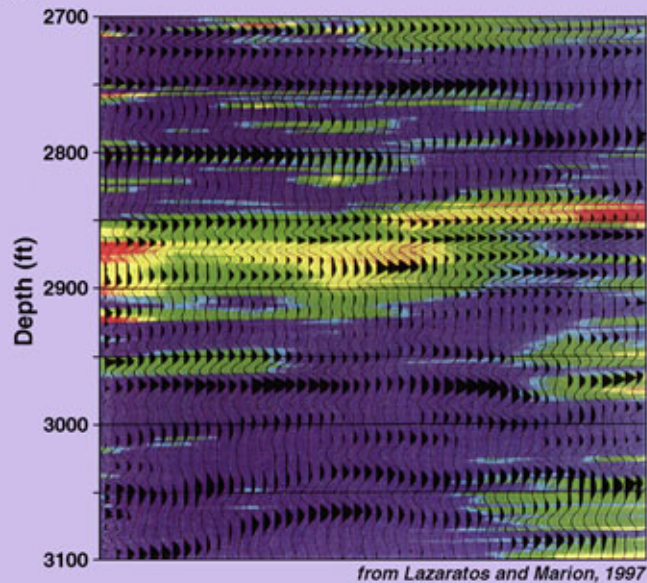
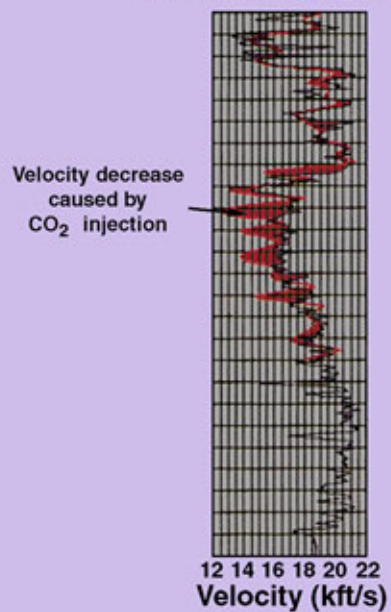
**Ronald C. Surdam,
Innovative Discovery Technologies, LLC**

Critical Attributes

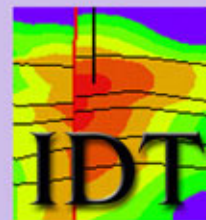


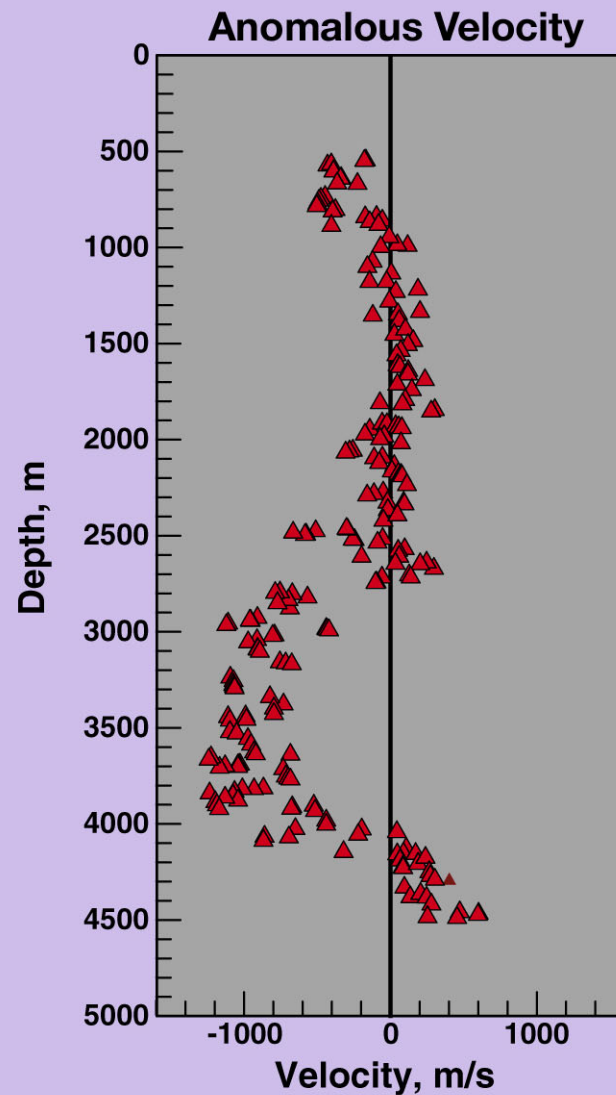
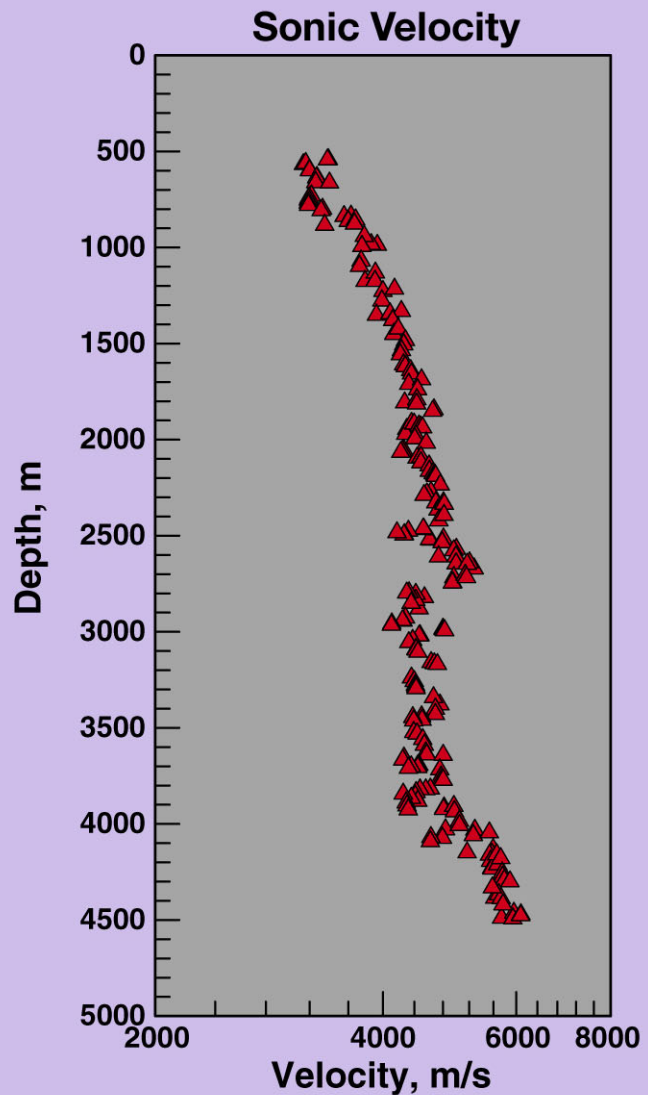
- Typically anomalously pressured (both over- and underpressured), but can appear to be normally pressured.
- Compartmentalized and gas-charged.
- Occur beneath a regional velocity inversion surface.
- No meteoric water connection.

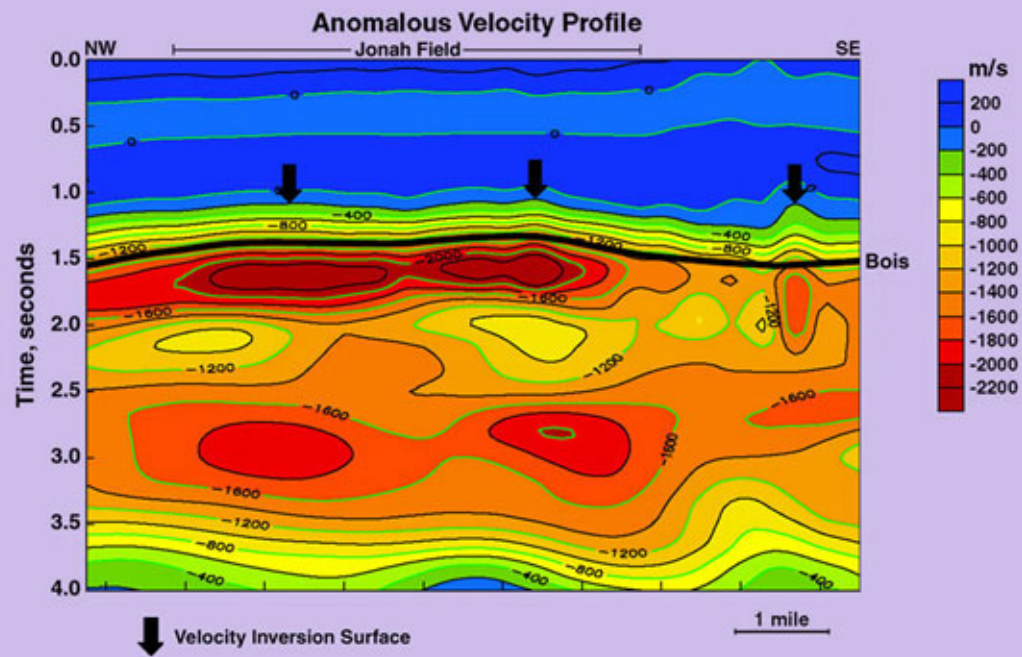
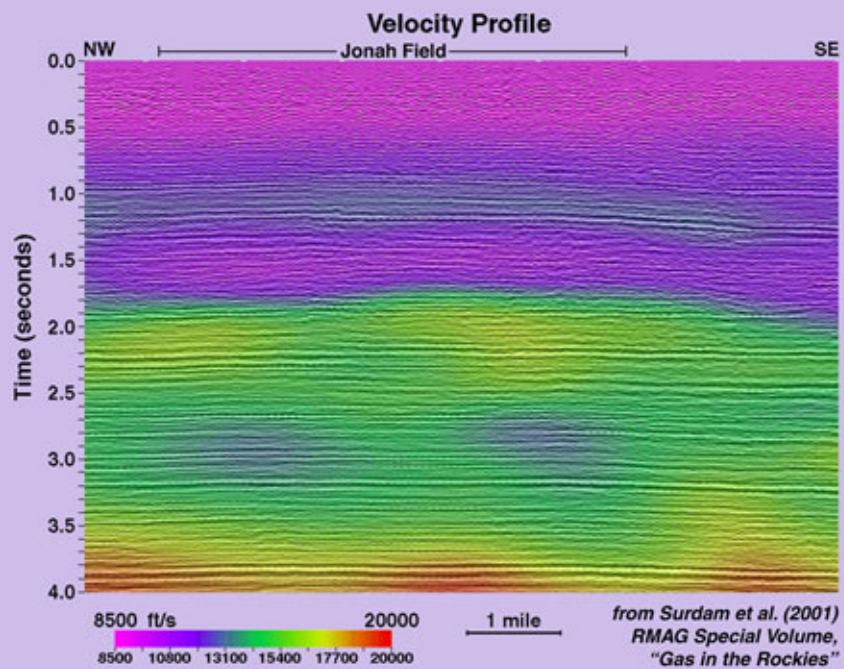
1995 Tomogram vs.
Pre-Injection Log at 1068



from Timur, 1987





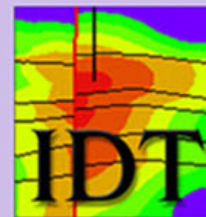
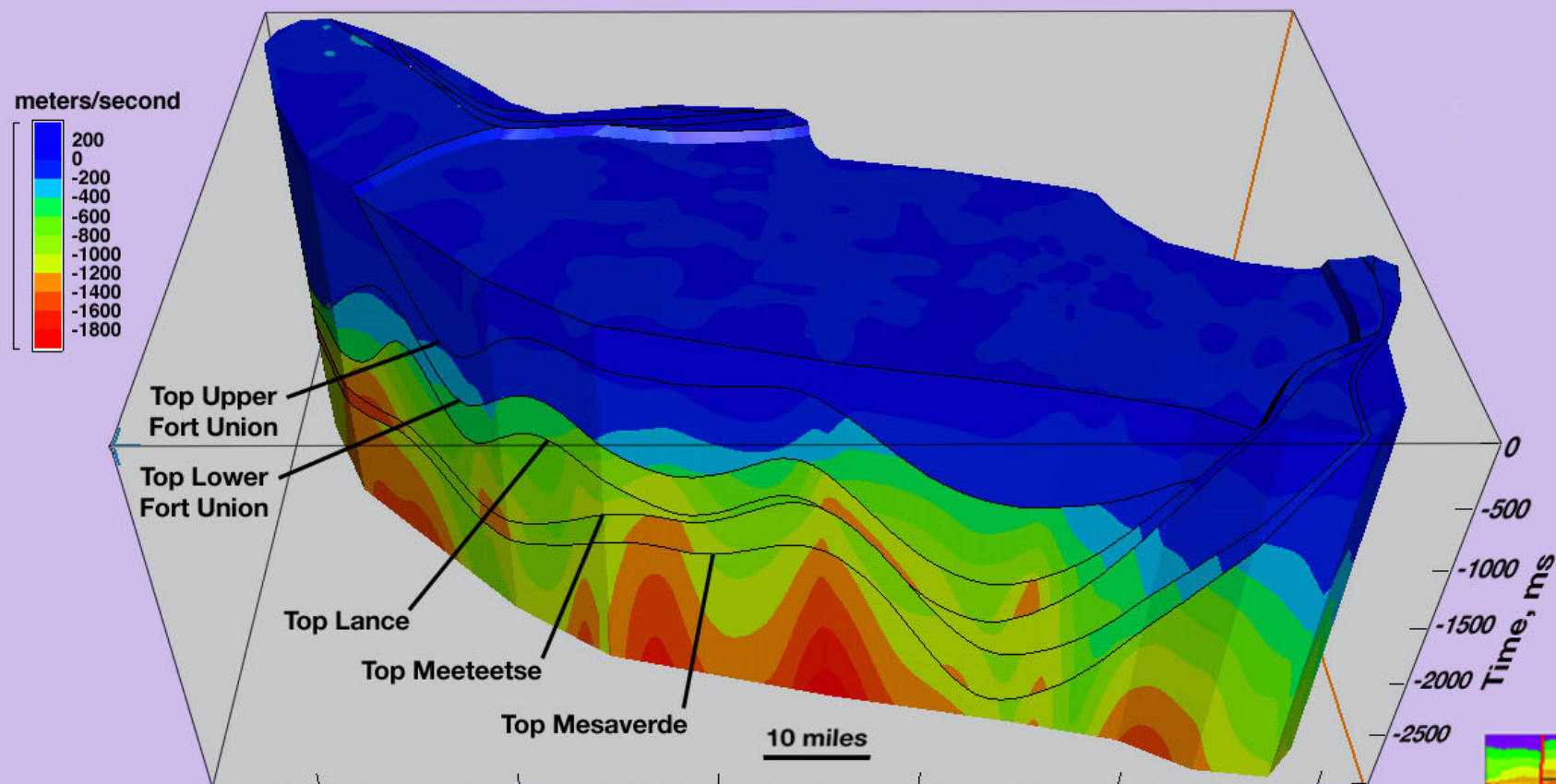




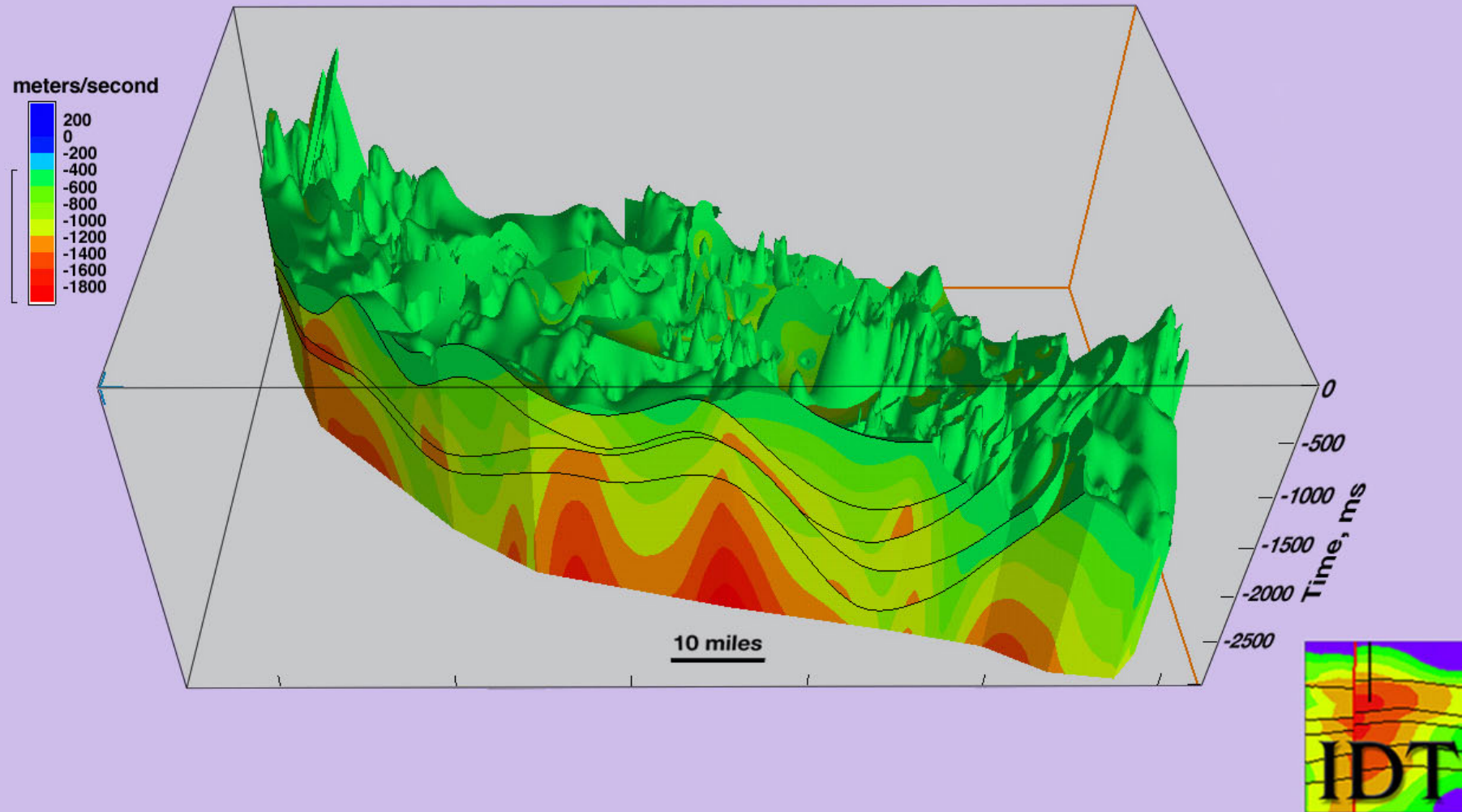
Echo 2-D seismic database for Wind River Basin.

Anomalous Velocity Model, Wind River Basin

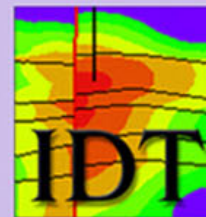
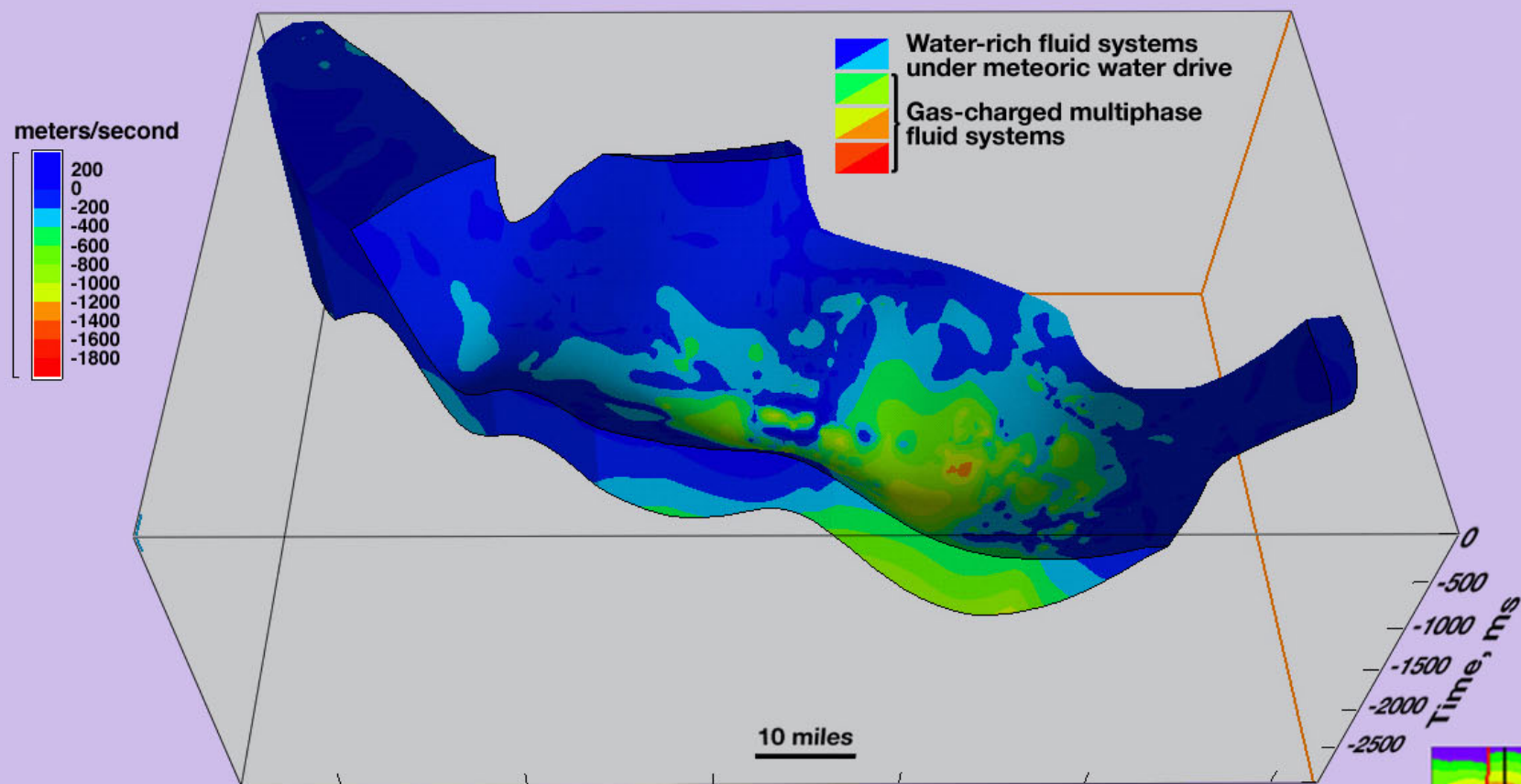
From 2-D Seismic Data, View to South



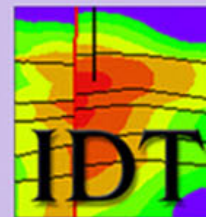
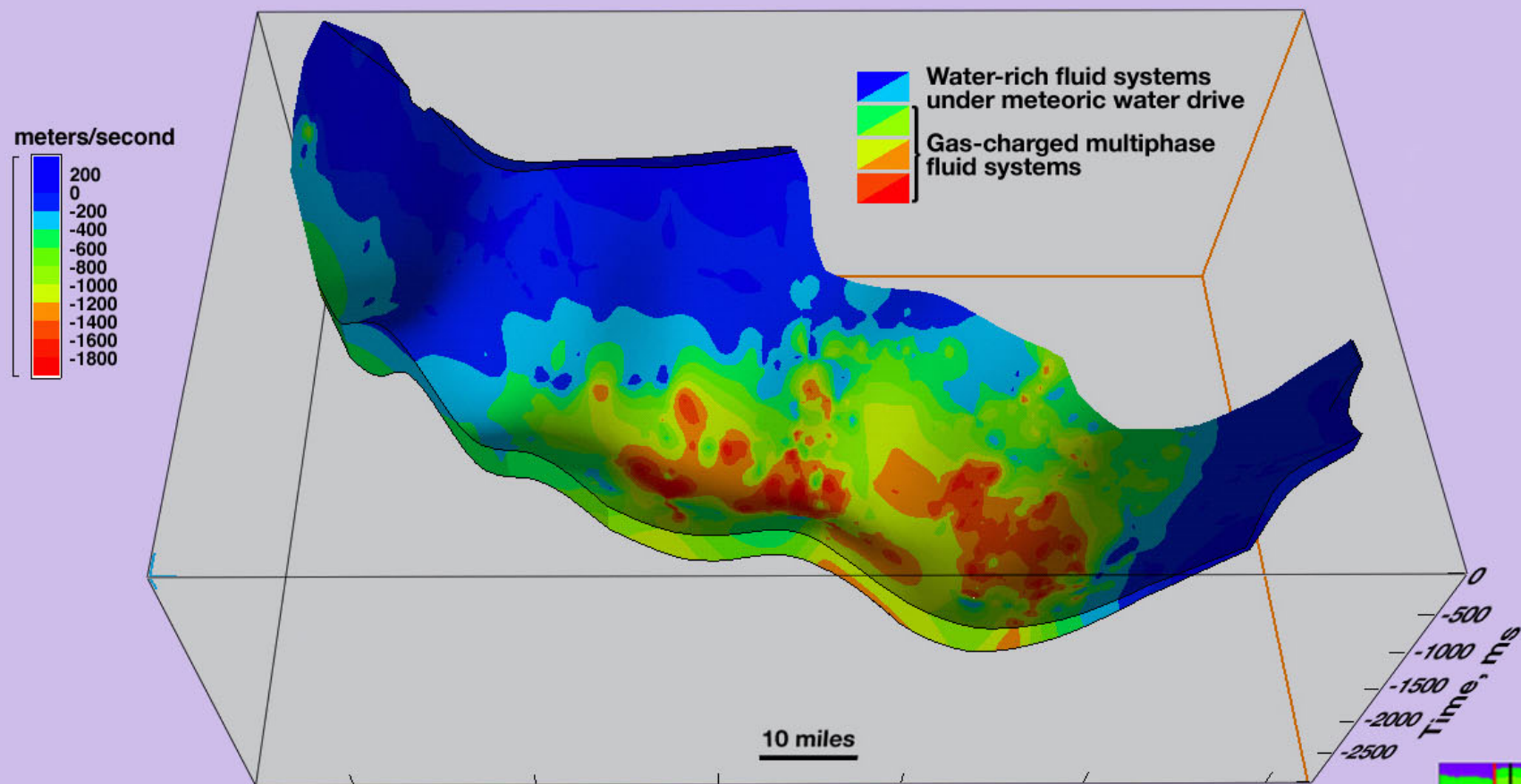
Anomalous Velocity Model, Wind River Basin Top of Anomaly, View to South



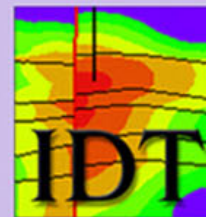
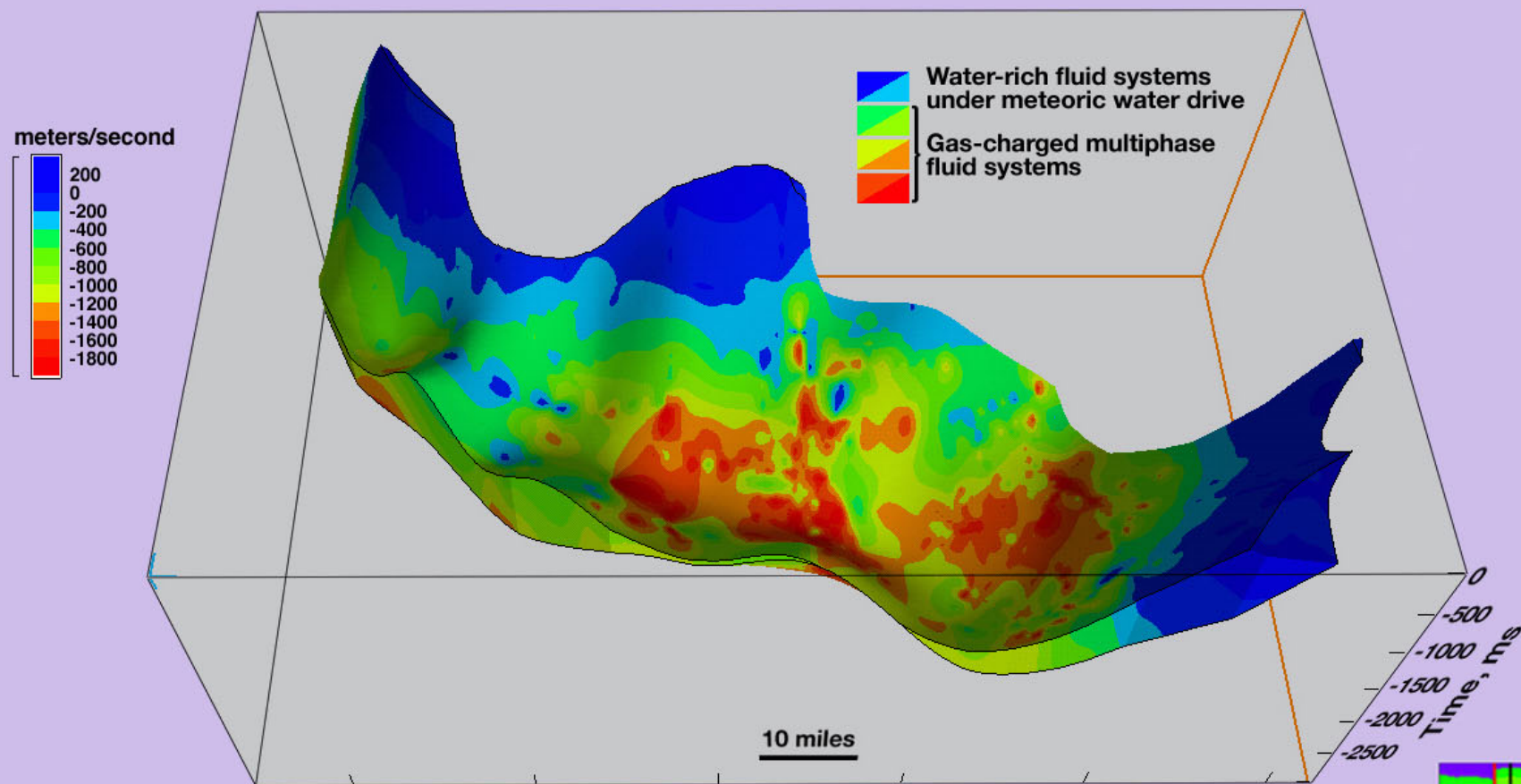
Anomalous Velocity Model, Wind River Basin Upper Fort Union, View to South



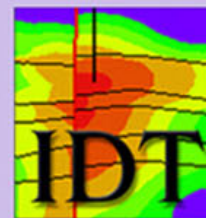
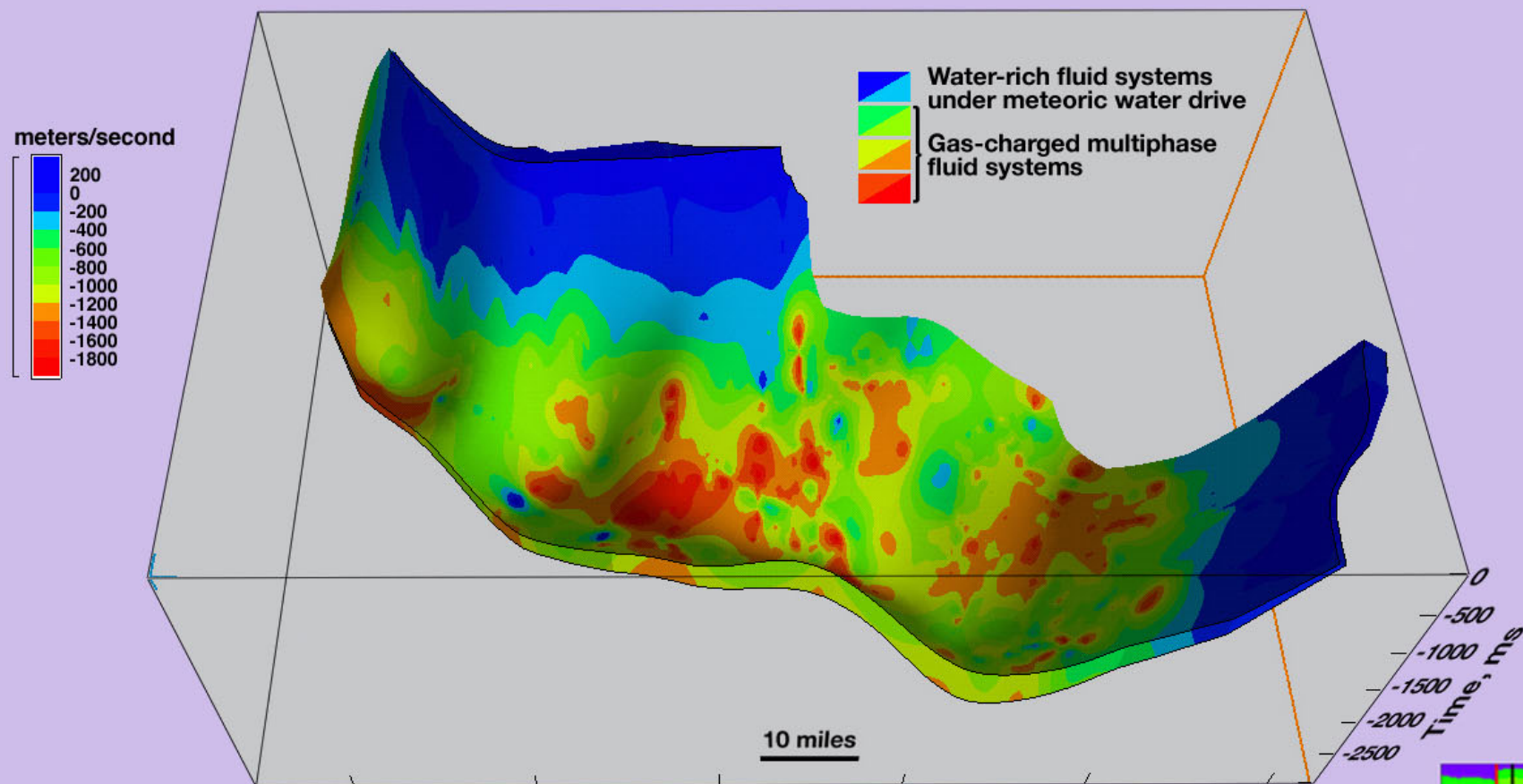
Anomalous Velocity Model, Wind River Basin Lower Fort Union, View to South



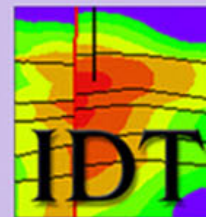
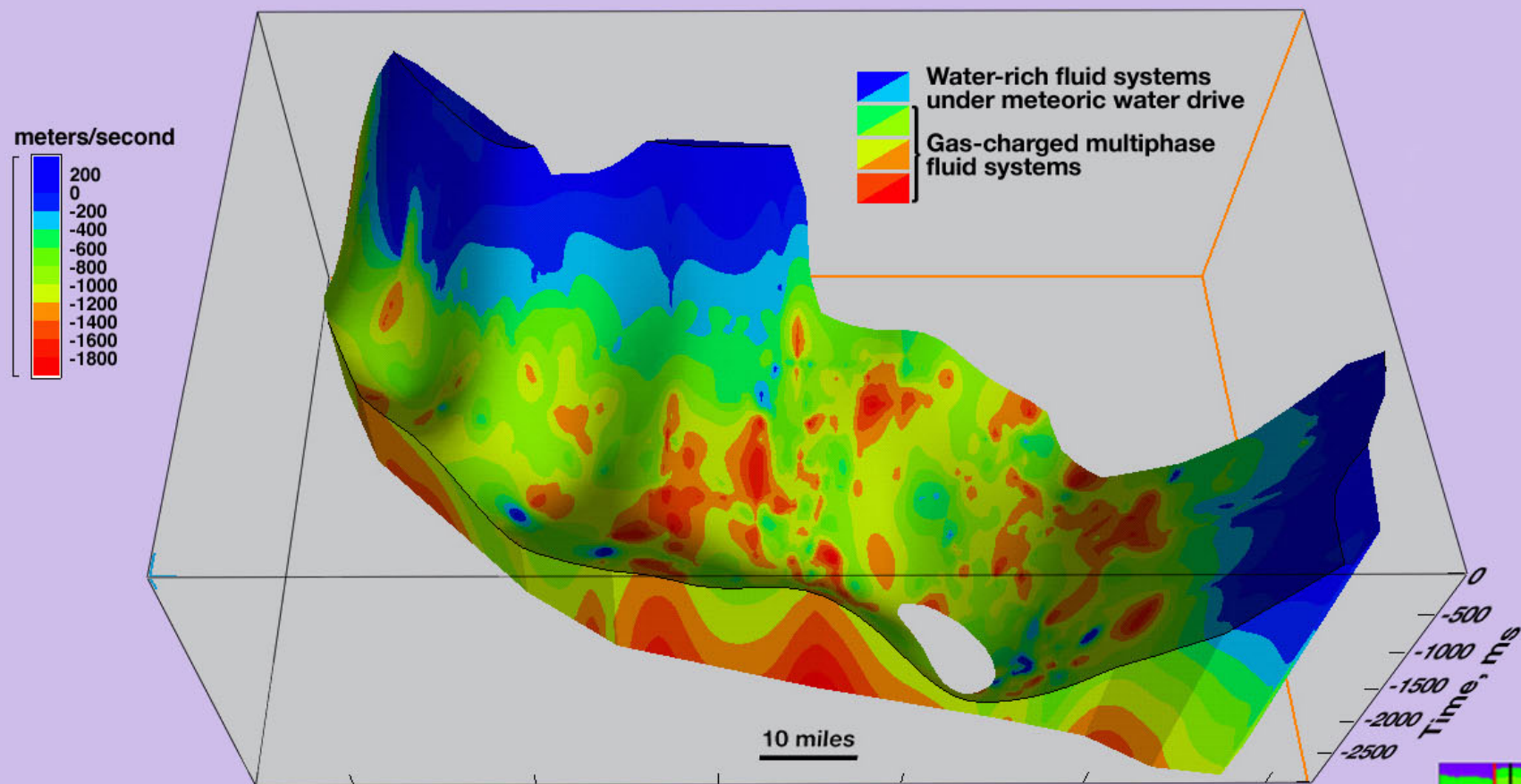
Anomalous Velocity Model, Wind River Basin Lance, View to South



Anomalous Velocity Model, Wind River Basin Meeteetse, View to South



Anomalous Velocity Model, Wind River Basin Mesaverde, View to South



Validity of the Techniques

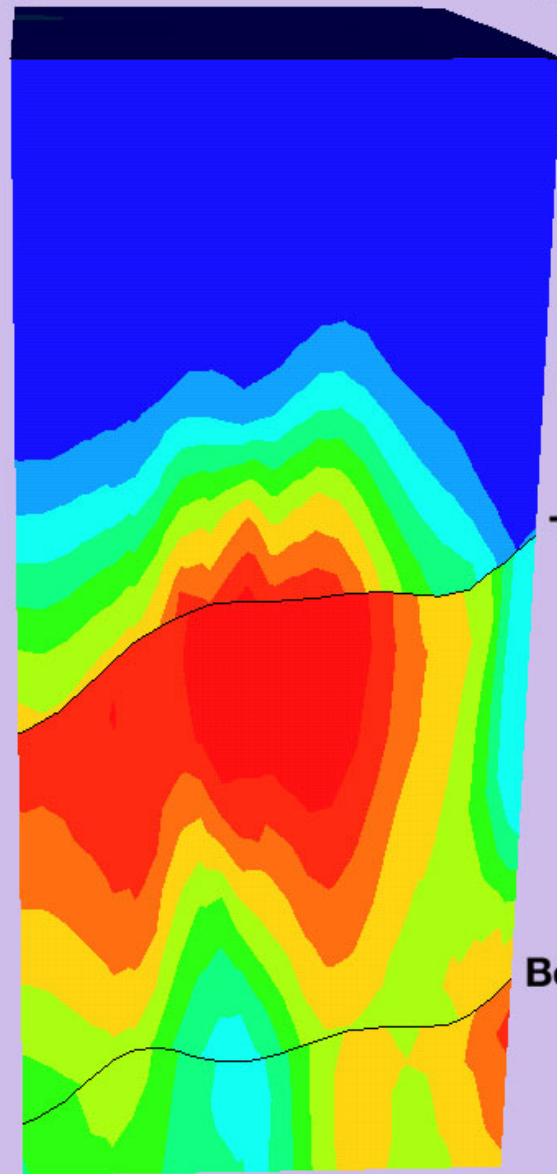
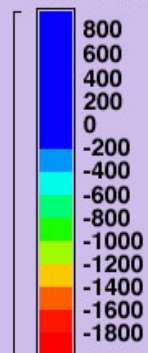


- **Construction of cross sections through the anomalous velocity volume coincident with 12 known gas fields producing from the lower Fort Union/Lance section in the Wind River Basin, Wyoming.**
- **Without exception each known gas field is associated with a significant and intense anomalously slow velocity domain (6 examples are illustrated).**

Madden Field Velocity Anomaly

S N

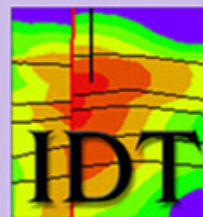
meters/second



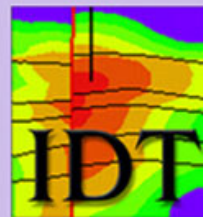
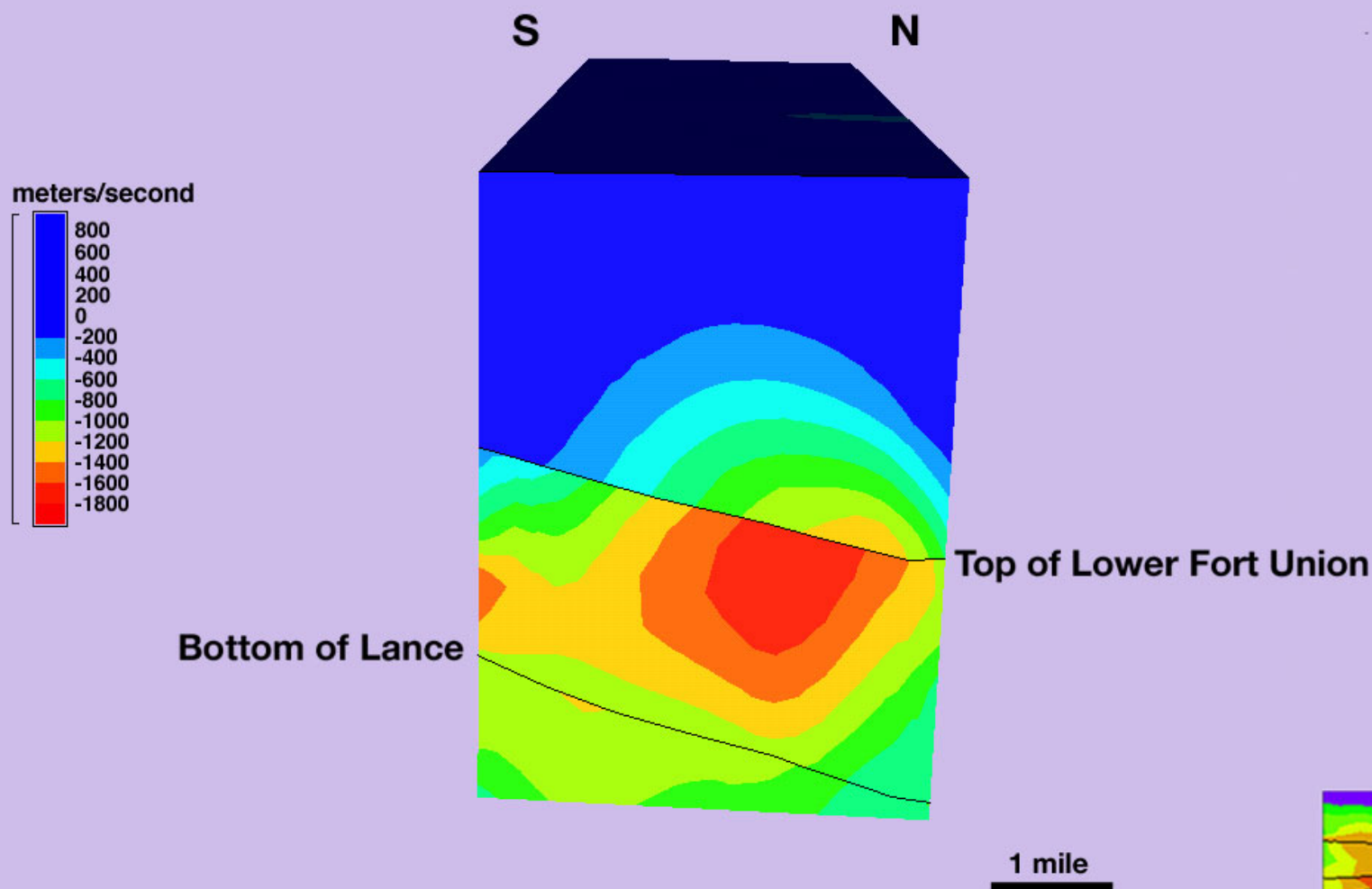
Top of Lower Fort Union

Bottom of Lance

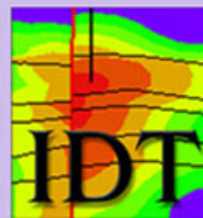
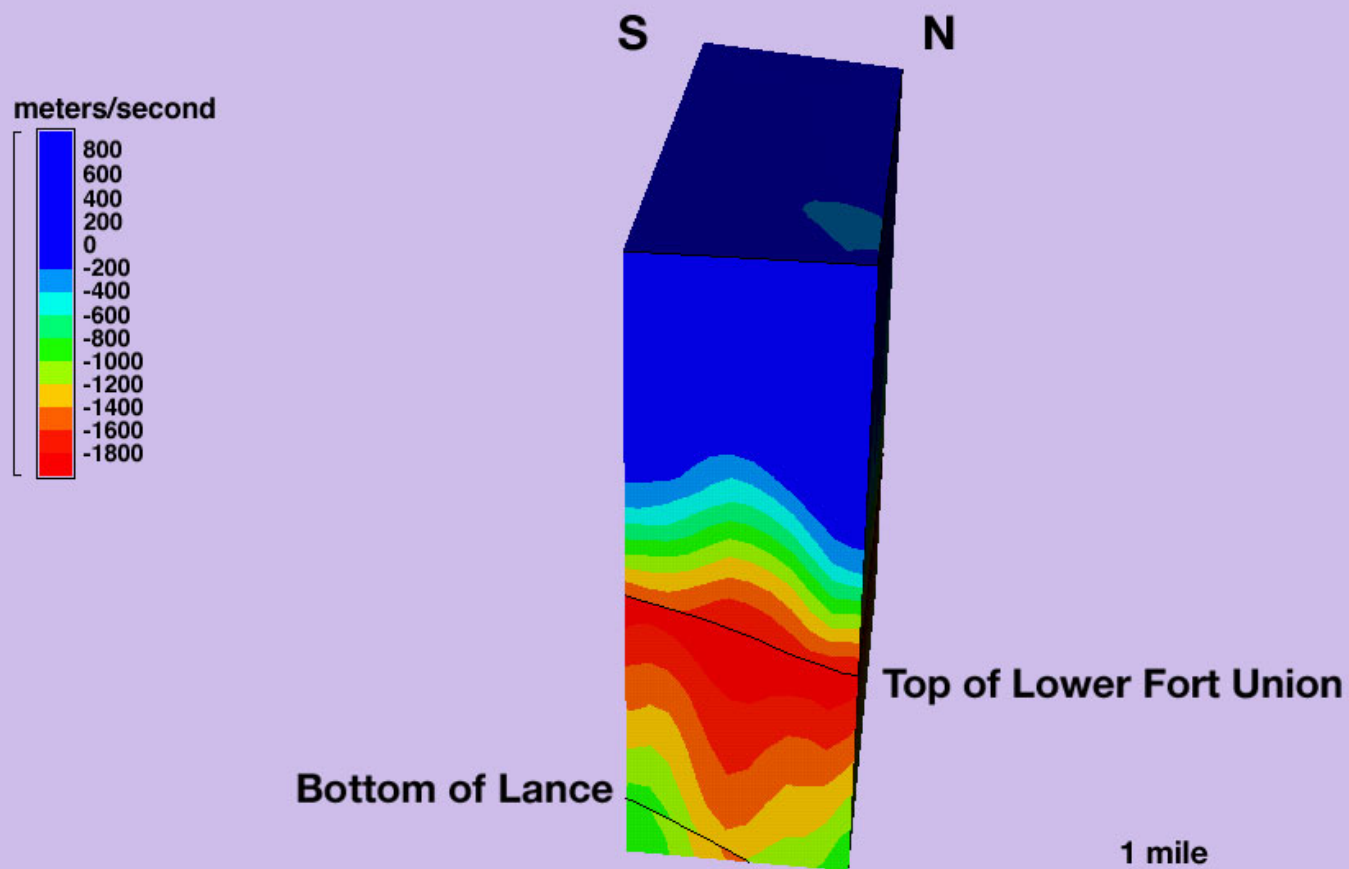
1 mile



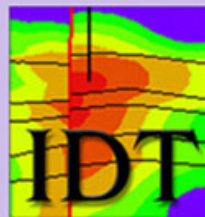
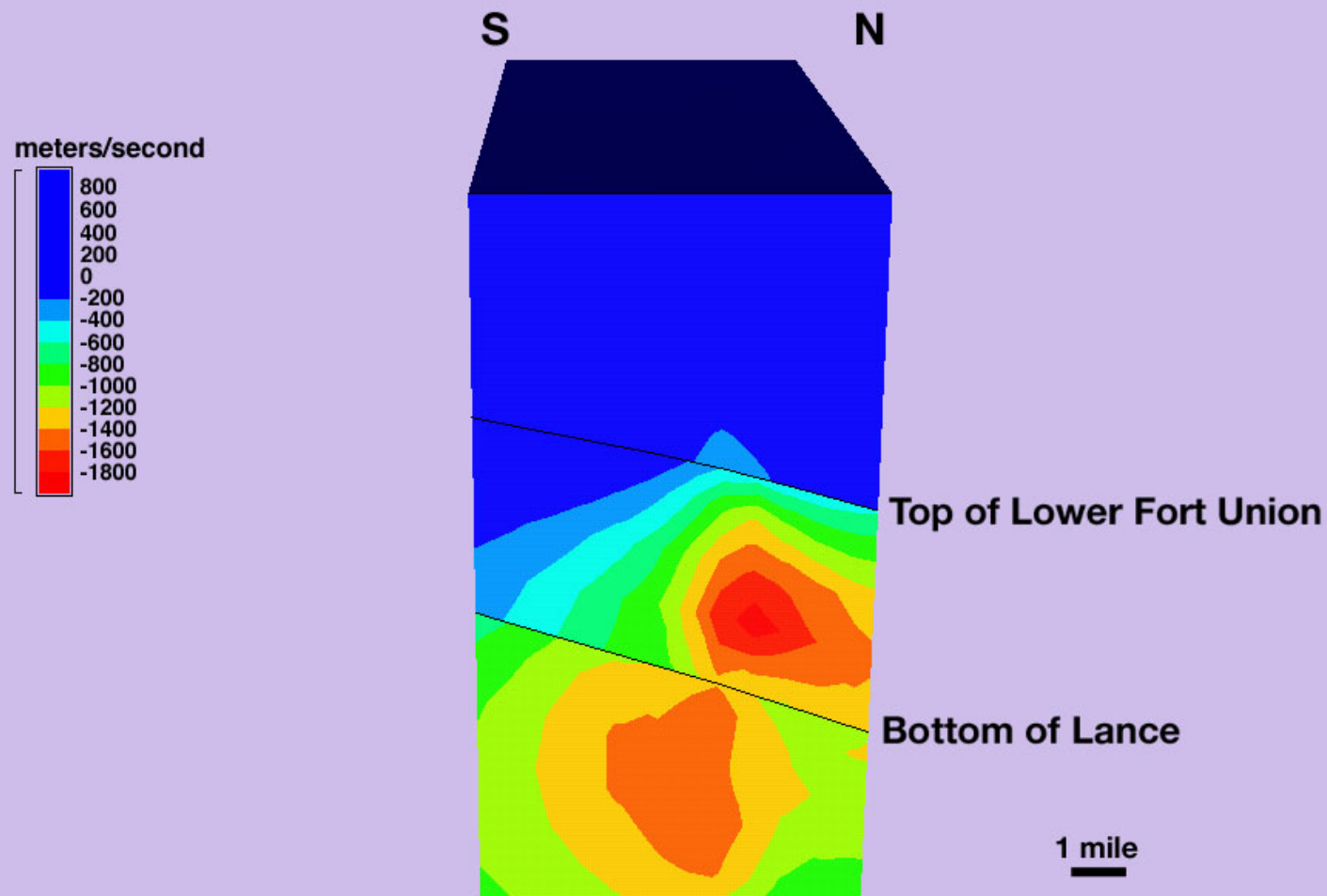
Frenchie Draw Field Velocity Anomaly



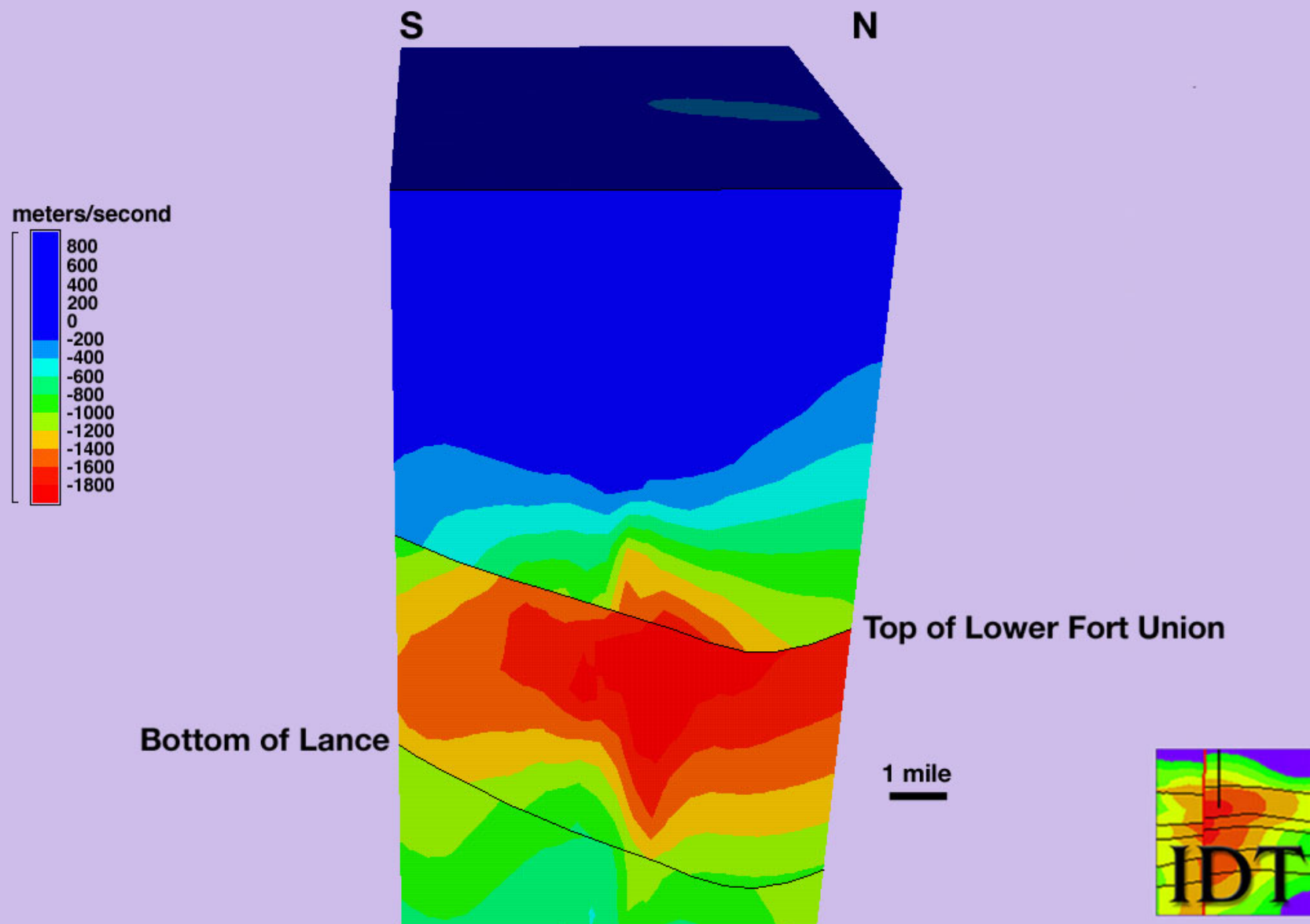
Dinty Moore Field Velocity Anomaly



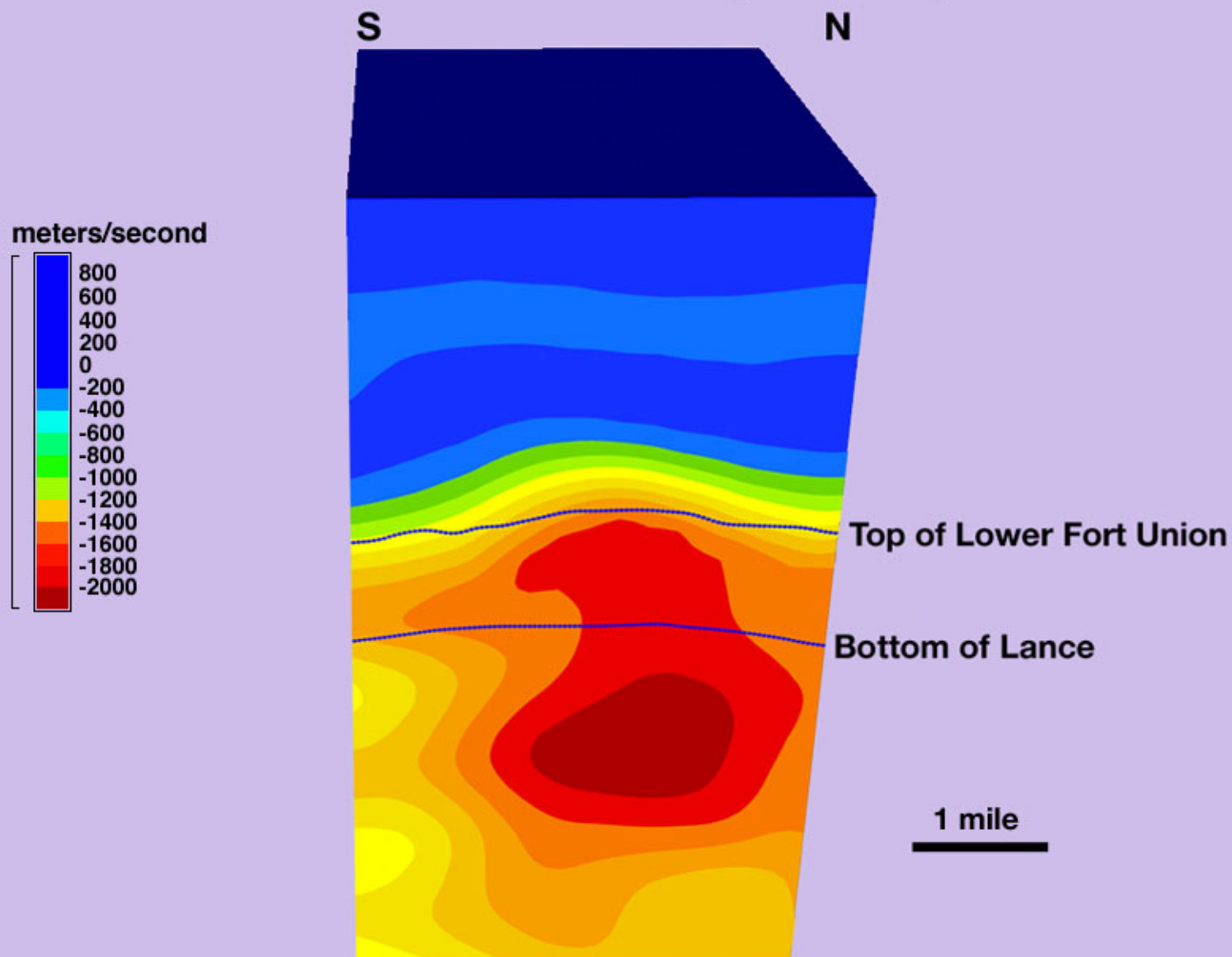
Squaw Butte Field Velocity Anomaly



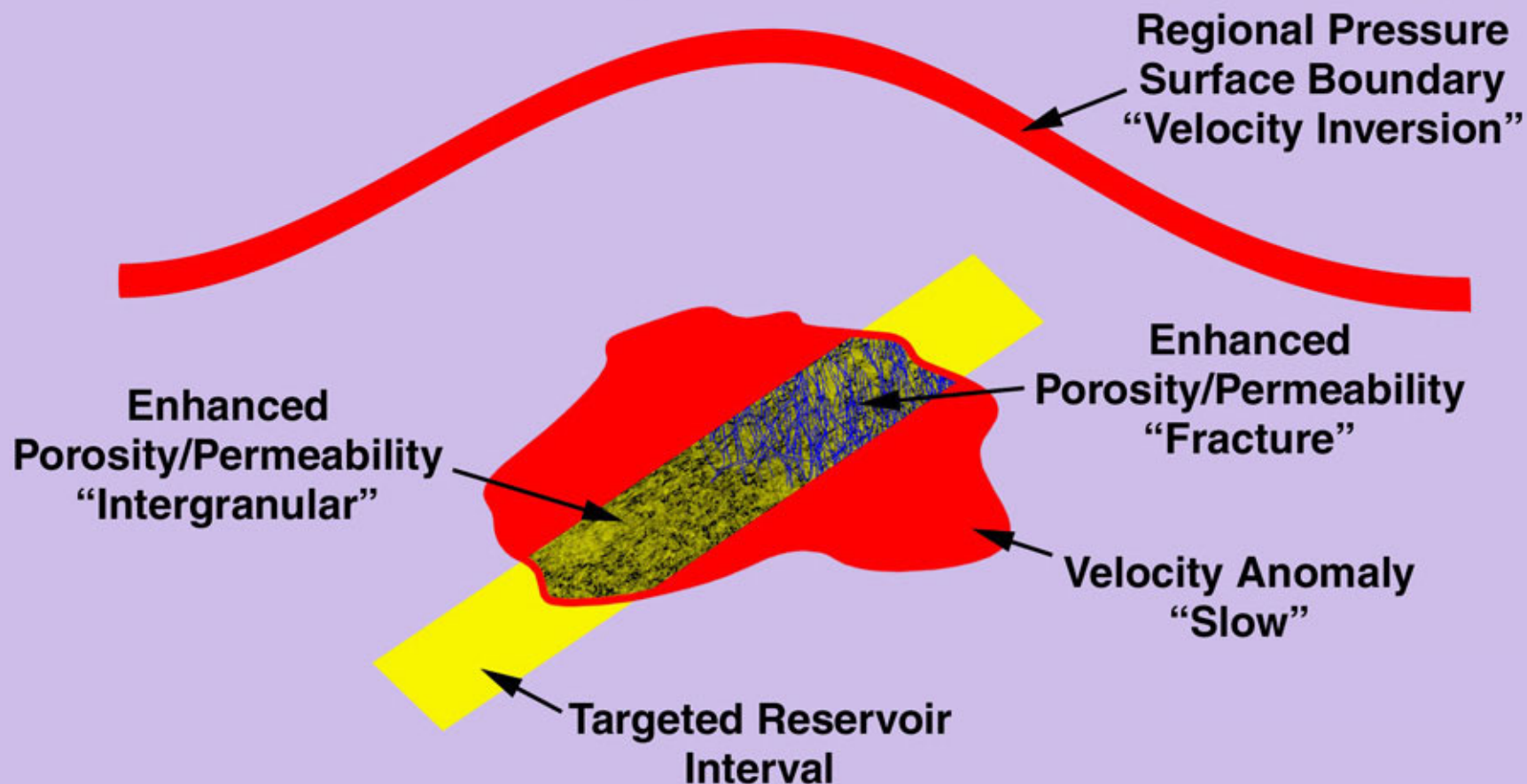
Kanson Draw Field Velocity Anomaly



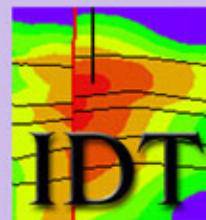
Pavillion Field Velocity Anomaly



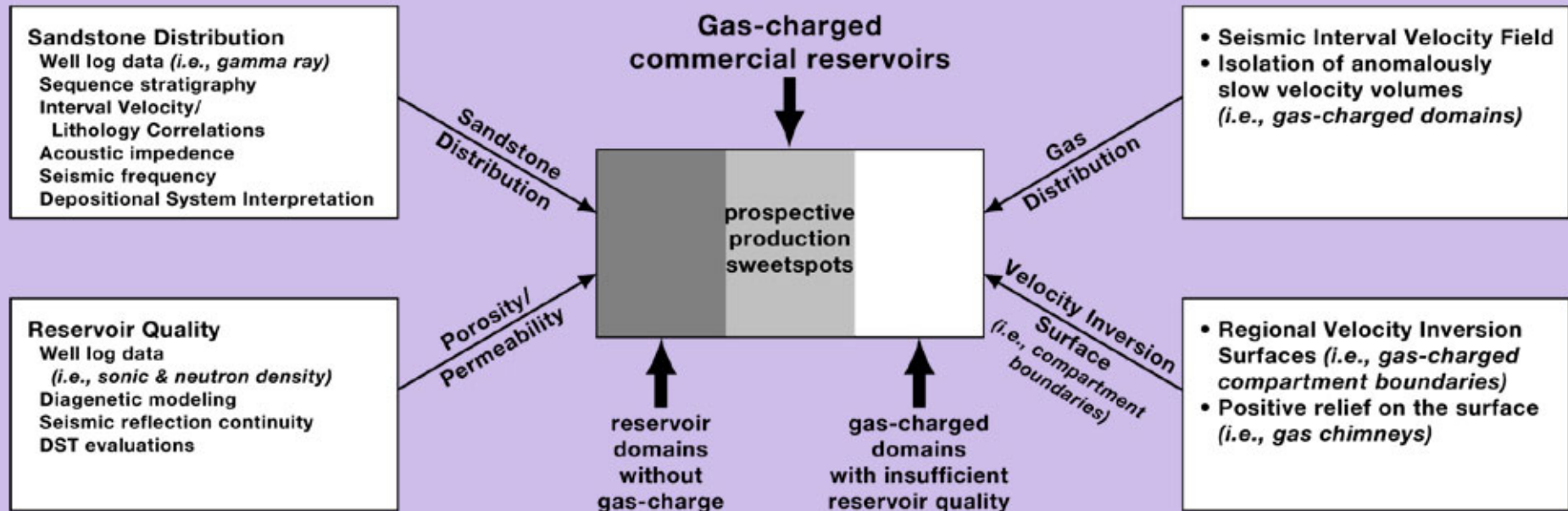
SweetSpot Delineation



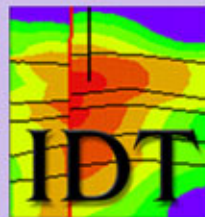
For optimum exploration/exploitation risk reduction it is important to determine where reservoir intervals with enhanced storage/deliverability intersect gas-charged domains.



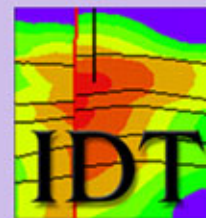
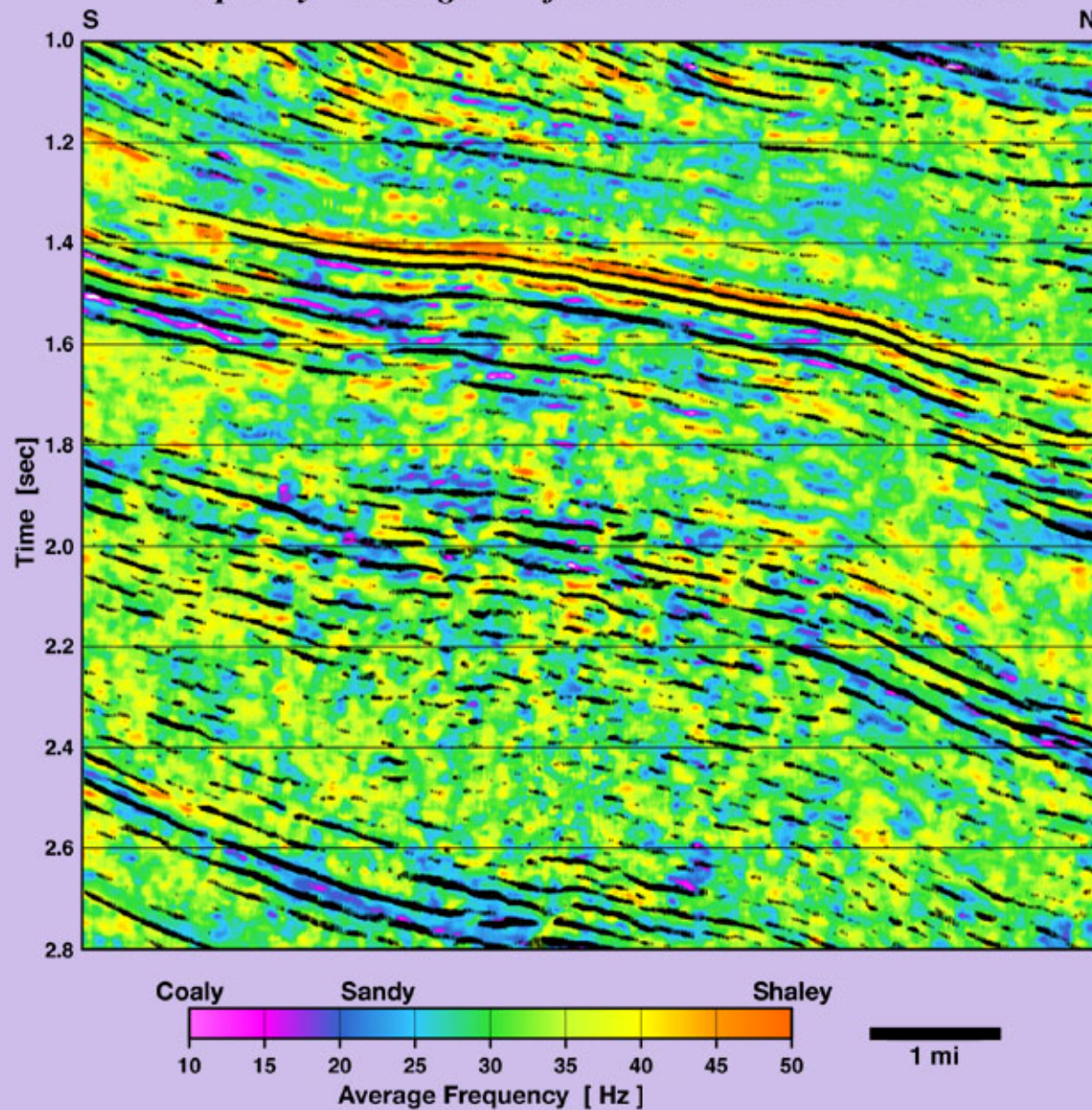
Prospect Delineation/Evaluation Strategy



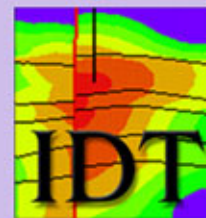
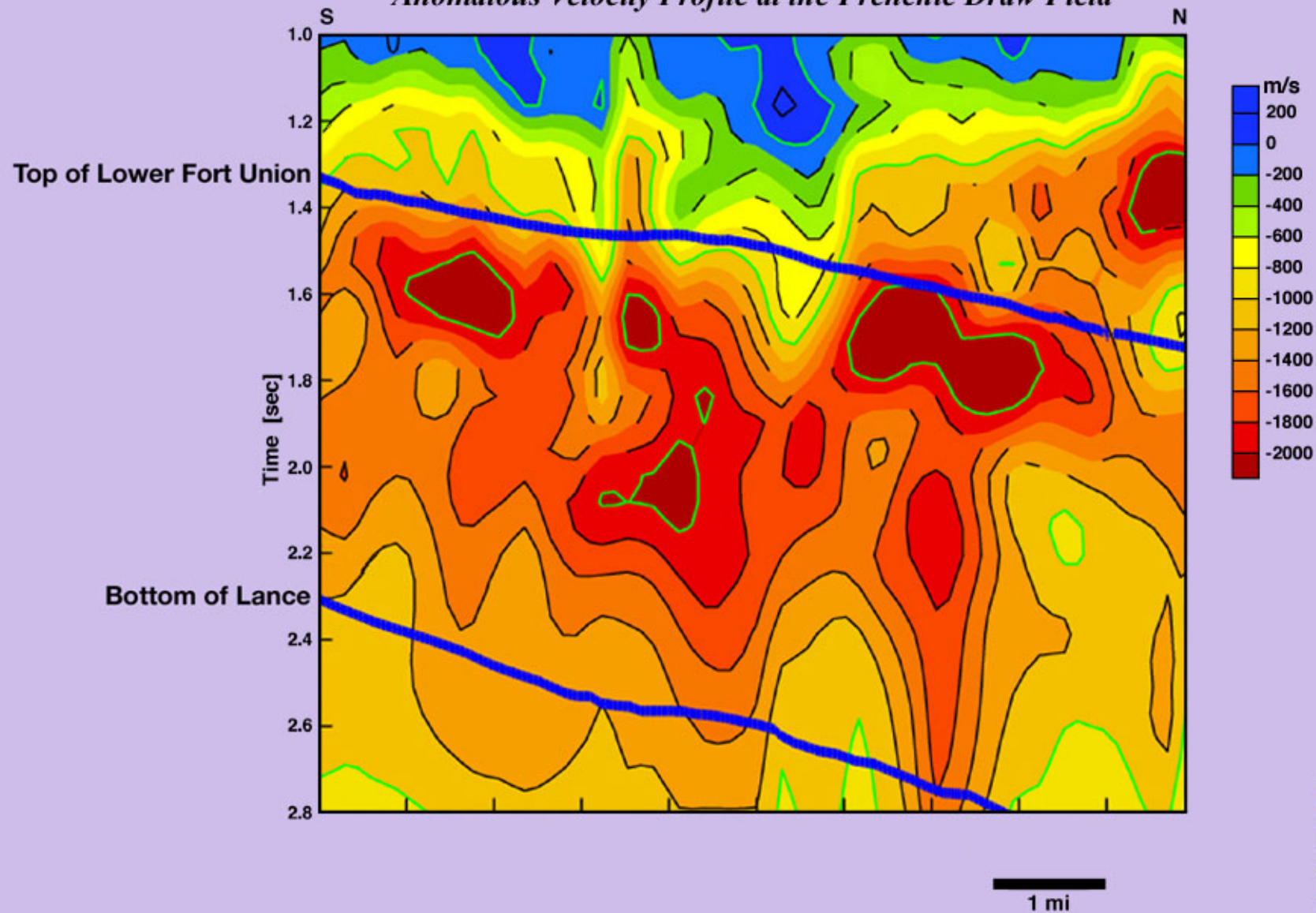
IDT Strategy for eliminating the most significant obstacles to grossly increasing the rate and magnitude of converting anomalously pressured “basin-center” gas resources to energy reserves. The objective of the IDT strategy is to determine where reservoir sandstones intersect and penetrate gas-rich domains within “basin-center” configurations.



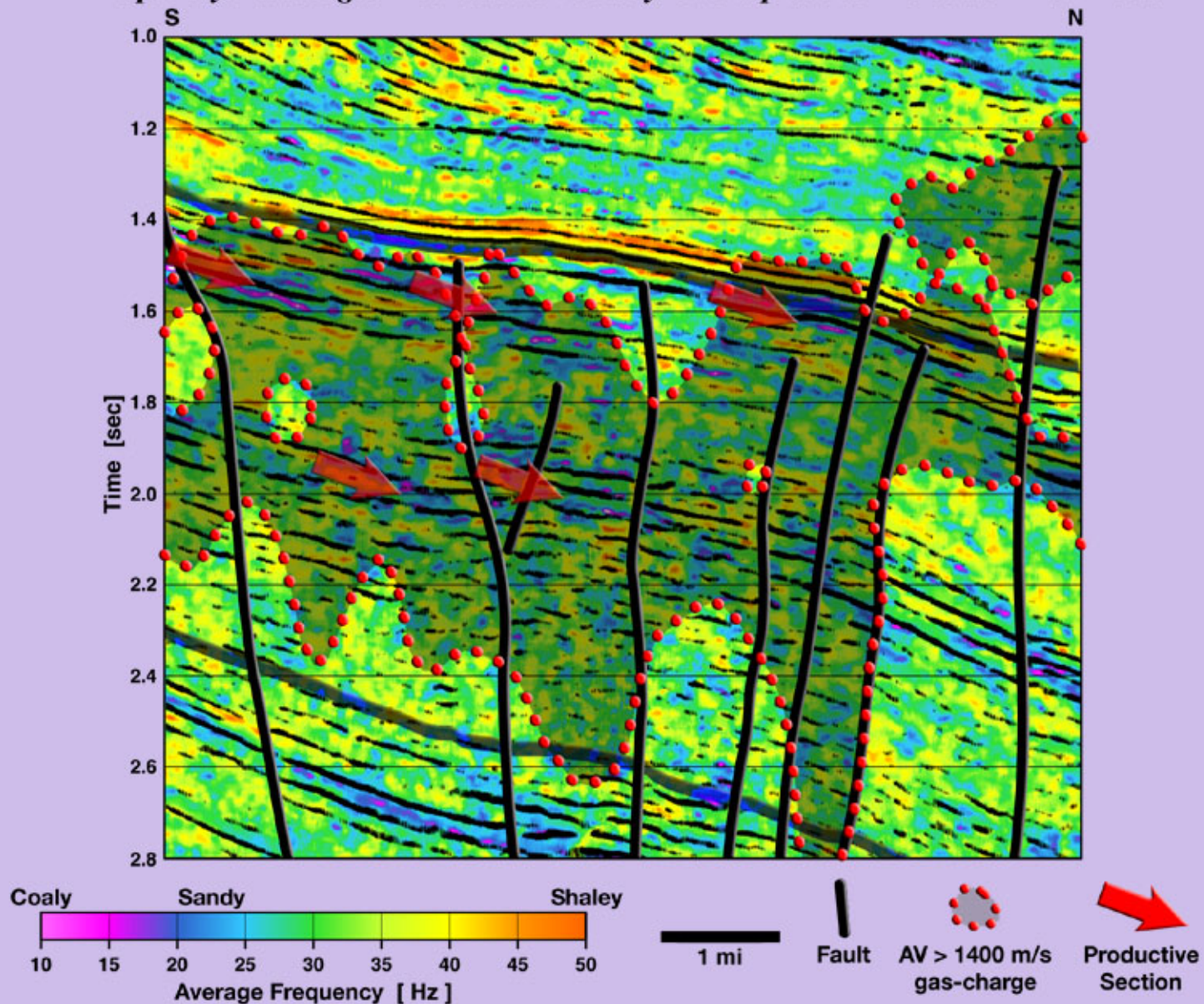
Frequency/Lithologic Profile at the Frenchie Draw Field

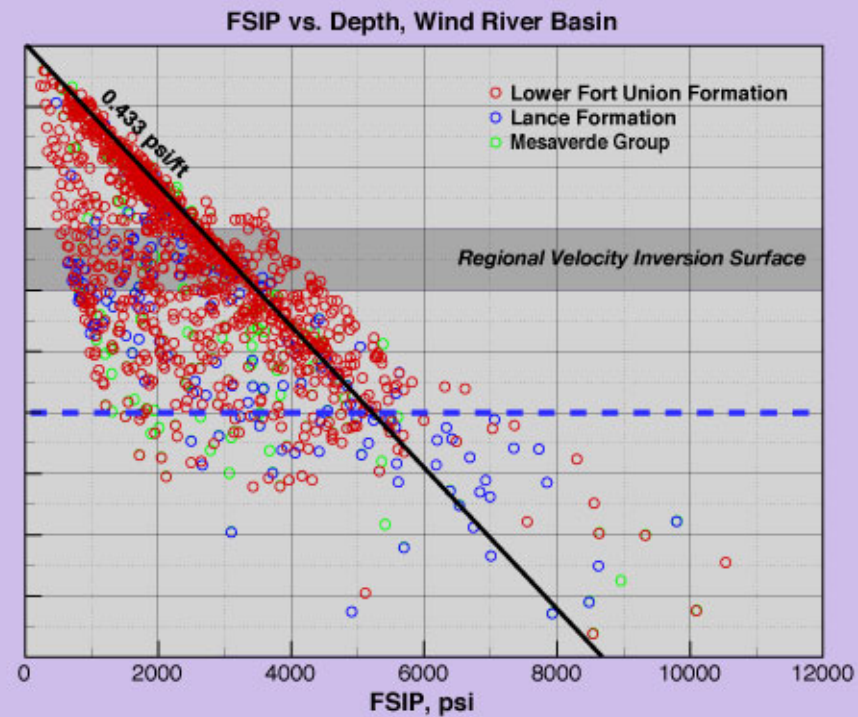
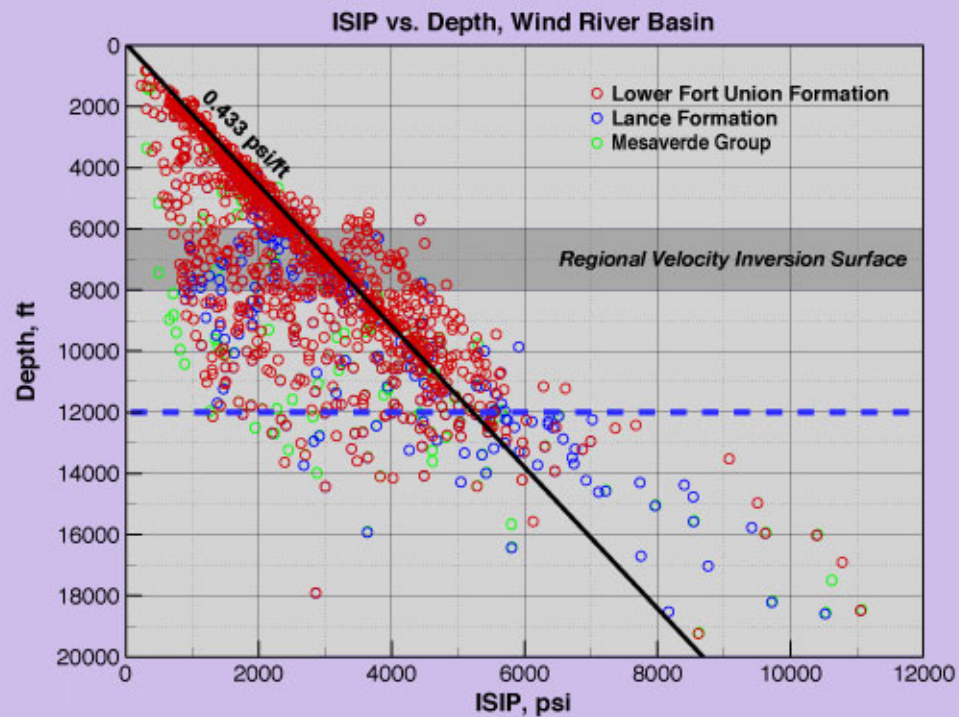


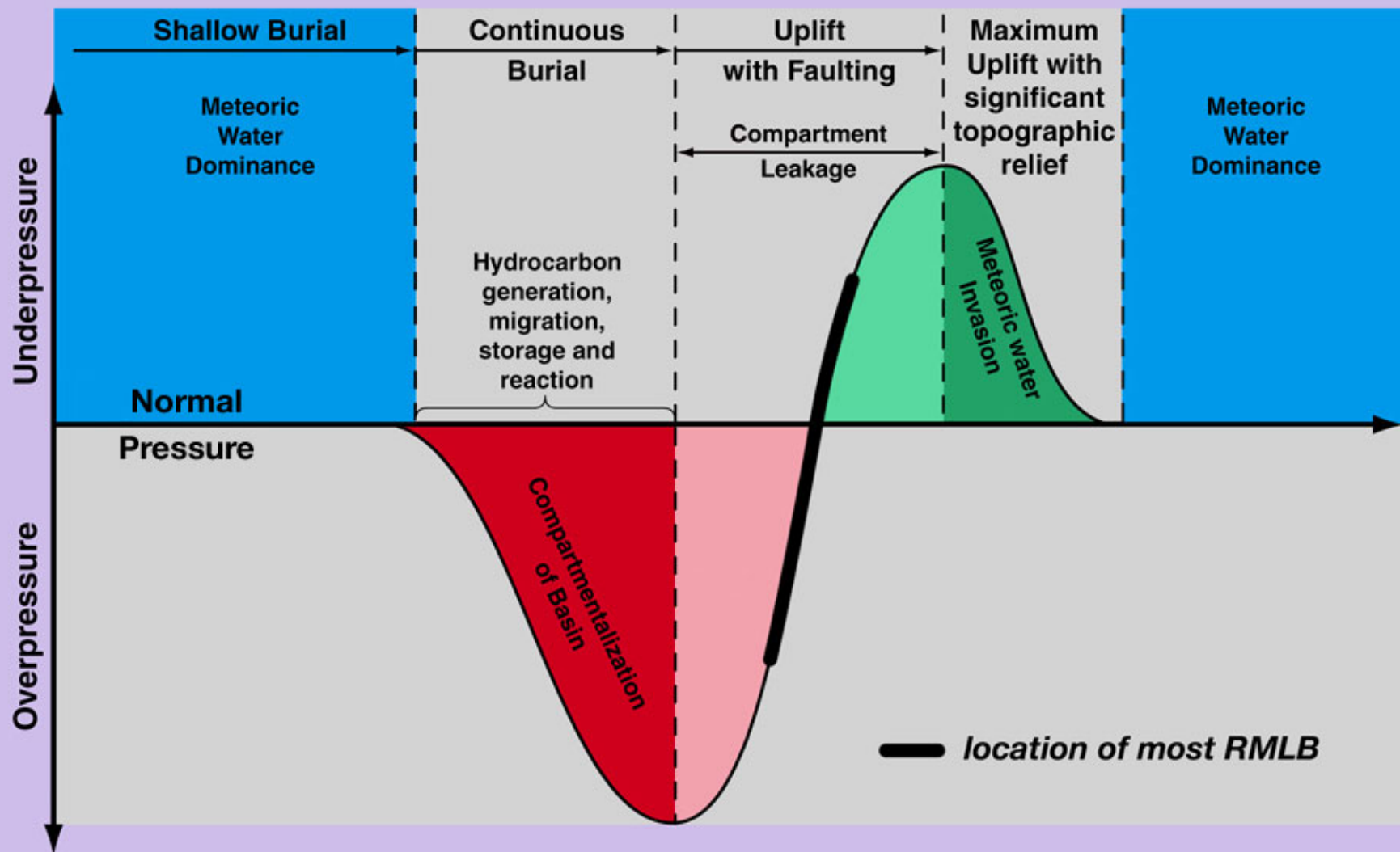
Anomalous Velocity Profile at the Frenchie Draw Field



Frequency/Lithologic/Anomalous Velocity Overlap at the Frenchie Draw Field

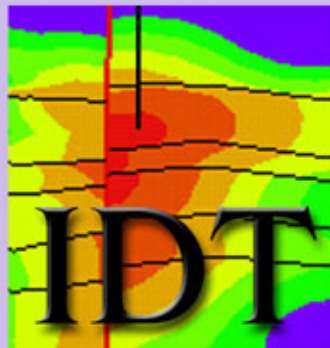






Pressure Evolution Characterizing Laramide Basins

Acknowledgements



We gratefully acknowledge the support provided for this work by the Department of Energy (DE-FC26-01NT41325) and Gary Covatch, the DOE Project Manager.

Echo Geophysical assisted us with data acquisition.

Lastly we acknowledge the long term encouragement provided to us by the energy industry.